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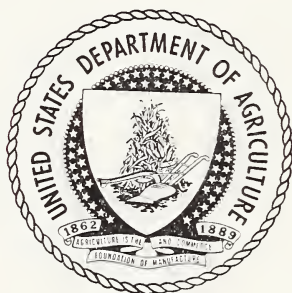
Official Specifications for

Locust Treenails

U.S. Forest Service

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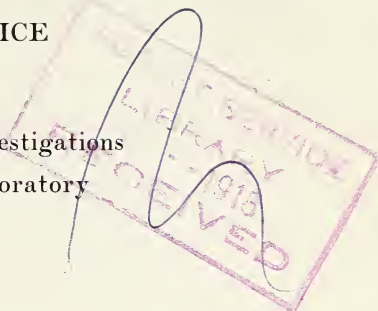
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SUMMARY REPORT ON DRIVING TESTS ON
TREENAILS AT THE YARD OF THE
AMERICAN SHIPBUILDING COMPANY,
BRUNSWICK, GEORGIA

Signed

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*In Charge, Section of Lumbering
Forest Products Laboratory*

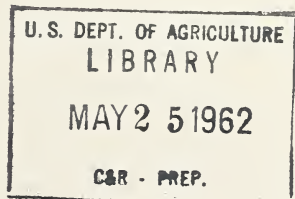
April 22, 1918.

Approved

E. H. CLAPP

Assistant Forester

April 23, 1918.



SUMMARY REPORT ON DRIVING TESTS ON TREENAILS AT THE
YARD OF THE AMERICAN SHIPBUILDING COMPANY,
BRUNSWICK, GEORGIA

INTRODUCTION

In accordance with the request of the United States Shipping Board, as the result of a suggestion offered by the American Bureau of Shipping, representatives of the Forest Service visited the yard of the American Shipbuilding Company, Brunswick, Georgia, and conducted driving tests on locust treenails. These tests were witnessed by a surveyor of the American Bureau of Shipping and by the resident inspector of the United States Shipping Board, Emergency Fleet Corporation for Brunswick.

OBJECTS OF THE TESTS

In view of the rigid requirements of the hull specifications for treenails a series of driving and wedging tests were conducted with the object of determining the proper specifications for treenails.

BASIS OF REPORT

The proposed specifications are based upon the results of a series of 150 driving and 50 wedging tests conducted in a manner as described in detail in the complete report attached and verified by a check test on 50 treenails containing a maximum of defects allowed in the proposed specifications.

In addition, driving tests were conducted on mulberry treenails to determine the effect of driving and at the same time support previous recommendations covering the use of this species for treenails.

RESULTS

In view of the results of these tests, as outlined in detail in the attached report, the following specifications for treenails are proposed:

SPECIFICATIONS FOR TREENAILS

SQUARES

Material

To be black or yellow locust (*Robinia pseudacacia*), live oak (*Quercus virginiana*), or Osage orange (*Toxylon pomiferum*). All squares to be entirely free of spike knots, knots in clusters, and to be sound,* except for the following defects which will be allowed:

1. Sound knots, the aggregate diameter of which does not exceed $\frac{1}{2}$ inch in each and every 12 inches of length, provided no knot is larger than $\frac{1}{4}$ inch in average diameter and no $\frac{1}{4}$ inch knot is closer than 2 inches to any other knot.

2. Cross or spiral grain not exceeding in slope more than 1 inch in a length of 20 inches.

3. Season checks, splits and shakes extending into the treenail for a distance not exceeding 1 inch on each end.

4. Sap on one end not exceeding $\frac{1}{4}$ inch in thickness on any face or $\frac{3}{8}$ inch on any corner for a distance of not more than $\frac{1}{4}$ the length of the piece.

(Sap, in addition to that allowed in item 4, wane surface worm holes, or similar defects which, in the judgment of the inspector, can be removed in turning the treenail will also be allowed. Iron streaks will not be considered defects.)

Size

Squares to be cut to sizes specified, allowing $\frac{1}{16}$ inch variation in thickness and width and $\frac{1}{2}$ inch in length.

Finish

All squares to be rough sawn.

*Sound material excludes squares containing worm holes which cannot be removed in turning, any form of rot or decay, powder post, and incased bark.

SPECIFICATIONS FOR TREENAILS

TURNED TREENAILS

Material

To be thoroughly seasoned (approximately 15 per cent moisture) black or yellow locust (*Robinia pseudacacia*), live oak (*Quercus virginiana*), or Osage orange (*Toxylon pomiferum*). All treenails to be entirely free of spike knots, knots in clusters and to be sound.* All treenails to be entirely of heartwood, except as allowed below. The following defects will be allowed:

1. Sound knots, the aggregate diameter of which does not exceed $\frac{1}{2}$ inch in each and every 12 inches of length, provided no knot is larger than $\frac{1}{4}$ inch in average diameter and no $\frac{1}{4}$ inch knot is closer than 2 inches to any other knot.

2. Cross or spiral grain with a slope not exceeding 1 inch in a length of 20 inches.

3. Season checks, splits and shakes extending into the treenail for a distance not exceeding 1 inch on each end.

4. Sap not exceeding $\frac{1}{8}$ inch in thickness nor more than $\frac{1}{4}$ the length of the treenail on the pointed end only.

(Iron streaks will not be considered a defect. Dips in the grain, which at the maximum slope do not exceed the allowable cross grain will be permitted.)

*Sound material excludes treenail containing worm holes, any form of rot or decay, powder post, and incased bark.

NOTE: Where the shipyard has the facilities for returning the treenails it is advantageous to the shipbuilder to specify that they be furnished rough turned $\frac{1}{8}$ inch larger than the nominal diameter. The shipbuilder then turns these treenails to the proper size.

NOTE: Tapered treenails are recommended by the Classification Society, but, in view of the difficulty in obtaining them, they will accept 2-drift treenails as here illustrated. Unless a tapered form is used, all treenails should be turned in 2 drifts, except in cases where the local representatives of the Classification Society will approve treenails having a uniform diameter throughout. Each drift of a 2-drift treenail should occupy $\frac{1}{2}$ the length of the treenail with an allowable variation of $\frac{1}{4}$ inch either way. The difference in diameter between the 2 drifts shall be $\frac{1}{8}$ inch.

NOTE: The use of tapered or drift turned treenails does not apply to framing timbers. Treenails for this purpose may be turned straight.

Size

Treenails to be turned to sizes specified, allowing $\frac{1}{2}$ inch variation in length.

Shape

Treenails to be tapered or drift turned. When drift turned, each drift to occupy $\frac{1}{2}$ the length of the treenail with $\frac{1}{16}$ inch difference in diameter between drifts. When tapered the difference in diameter between the small and large end to be $\frac{1}{16}$ inch.

Finish

Treenails to be smoothly turned and to have points tapered for a length of about $\frac{3}{16}$ inch to about a 30° bevel at the pointed end. No treenails with flat faces will be accepted.

GENERAL INSTRUCTIONS COVERING TREENAILS PURCHASED
UNDER THE ATTACHED SPECIFICATIONS

1. PURPOSE OF THE SPECIFICATIONS

The purpose of the attached specifications is to secure treenails from commercial material upon the basis of serviceability. Certain defects which do not affect the strength of the treenail are allowed. In view of the peculiar growth characteristics of the raw material used the specifications have been so drawn as to obtain stock compatible with the use intended and at the same time enable manufacturers of treenails to use as much of the log as possible.

2. SPECIES

Black and yellow locust (*Robinia pseudacacia*), live oak (*Quercus virginiana*) and Osage orange (*Toxylon pomiferum*) are the species of wood allowed. It is probable that clearer stock can be secured from live oak than from either one of the other two woods mentioned, for the reason that trees of this species are more uniformly clear than those of the locust or Osage orange. Honey locust (*Gleditsia triacanthos*) is a comparatively porous wood possessing considerably less strength than black (*yellow*) locust. Treenails made from this species of locust are not allowed under the specifications.

3. SAPWOOD

The sapwood of any species of wood is less durable than the heartwood, and treenails containing sapwood when driven into the hull of a ship are liable to decay and become loose. Especially is this true of treenails used in that portion of the hull either below or at the water line. Accordingly sapwood in a treenail is a defect to be guarded against. The attached specifications allow sapwood only in that part of the treenail which is not likely to be subjected to conditions fostering decay. This sap allowance is in addition to that permitted in any portion of the length of a square which will be removed in turning the treenail. (See Plate A.)

4. DEFECTS

Knots

Knots weaken the wood and often interfere with proper wedging. As allowed in the specifications they are limited in size and location and classified as to character. Knots to be admitted must be sound. (See Plate B.)

Bird Pecks

Bird pecks are caused by birds pecking holes through the bark of the tree into the wood. Usually this mars the wood but little, often only slightly discoloring it. Defects of this character are therefore admitted to the extent outlined in the specifications.

Season Checks

Season checks are separations in the wood at right angles to the annual rings of growth. They usually show in the ends of the treenails, but are also often found in the body of the stick. The specifications make allowance for these defects to a limited extent only in the ends of treenails.

Splits

Splits generally appear at the end of a stick as a separation of the wood between the annual rings of growth. Splits, like checks, weaken the wood, and are allowed only as included in the specifications.

Worm Holes

These are small open holes often as large as $\frac{1}{4}$ inch in diameter, easily seen and caused by worms boring in the wood. Where these holes penetrate the wood at right angles to the grain the extent of the injury is not visible and such defects should be guarded against. No worm holes of any kind are allowed under the specifications in turned treenails. In inspecting squares, however, one will often be found that contains a worm hole running parallel with the length of the square. Such worm holes if not too deep, are usually removed in turning the treenail and are allowed under the specifications. (See Plate C.)

Cross Grain

In cross grained treenails the grain of the wood does not run parallel with the center line of the piece. Treenails of this kind are liable to break along the line of the cross grain, and should be carefully guarded against. The specifications allow cross grain but only within certain limitations. (See Plate D.)

Dry Rot

This defect, often referred to as "dote," in treenail stock is very serious. Some treenails are affected for their entire length with dry rot. In such material the defect is readily recognized, since the stick is of very light weight and a sharp blow will cause it to break off at the point struck. (See Plate E.)

Wind Shake

This is a fracture of the wood and appears as a split or separation of the wood between the annual rings of growth. Such a defect may be found in any part of the treenail and is caused by severe bending strain in the living tree during a windstorm. These defects are serious and are not allowed in the specifications. (See Plate F.)

5. SIZE

Inspectors will determine by measurements on random selections that treenail squares or turned treenails are true to form and within the range of dimensions specified. As indicated in the specifications a variation of 1/16 inch is allowed in thickness and width and 1/2 inch in length in treenail squares, while in the turned treenails a variation of 1/2 inch in length only is permissible.

6. GENERAL

It is a difficult matter to formulate a set of specifications for the inspection of treenails which will cover every phase of the subject. While the size and location of knots and limitations covering other defects are clearly described in the specifications, the effect of these defects on serviceability should be

borne in mind and the lines not drawn too sharply when it is very clear that the treenail will give service equal in all respects to one free from such defects. (See Plates G, H, I and J.)

SUGGESTIONS FOR INSPECTORS

1. Read carefully "General Instructions" and examine closely each of the appended illustrations.

2. Measure the first square or turned treenail and others at random during the inspection for proper dimensions.

3. Inspect each square or turned treenail for extent and location of defects if any.

4. Arrange space for two piles; the accepted treenails and the rejects.

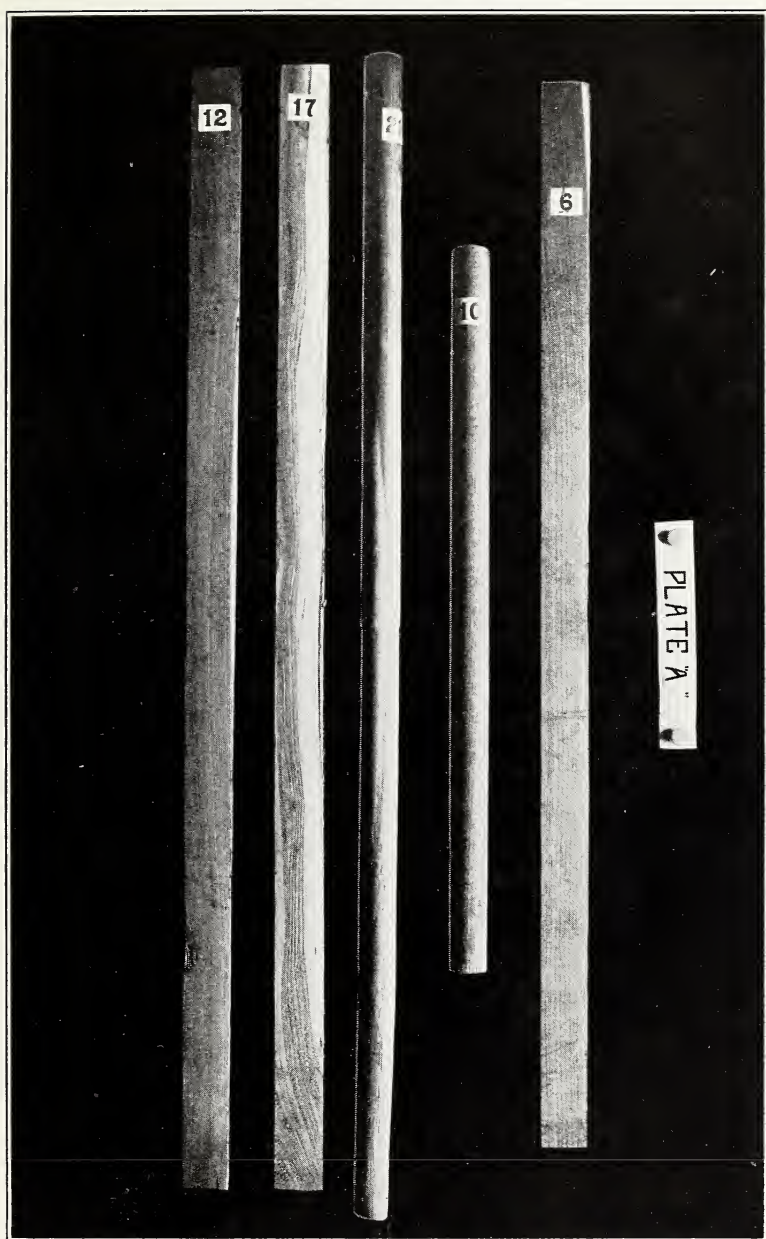
5. Tally each piece on tabular form similar to the following:

TREENAIL SQUARES			TURNED TREENAILS		
Dimensions	Acceptable	Rejected	Dimensions	Acceptable	Rejected
1 $\frac{5}{8}$ " x 32	1111	1111	1 $\frac{3}{8}$ " x 32	1111	1111
	1111			1111	11
	1111			1111	
	1111			1111	
	111			11	

APPENDIX

DESCRIPTION OF PLATE "A"

- No. 6. *Accepted treenail square.* Sap on one end not more than $\frac{1}{4}$ " in width or one-quarter the length of the piece.
- No. 10. *Accepted turned treenail.* Sap on one end not more than $\frac{1}{8}$ " in width or one-quarter the length of the treenail. (This treenail is less than 30" long and therefore not drift turned.)
- No. 12. *Accepted treenail square.* Sap in body of the stick which will be removed in turning the treenail.
- No. 17. *Rejected treenail square.* Sap in body of the stick which cannot be removed in turning the treenail.
- No. 21. *Rejected turned treenail.* Sap in the body of the piece. (Longer than 30" and for this reason drift turned.)



12

17

21

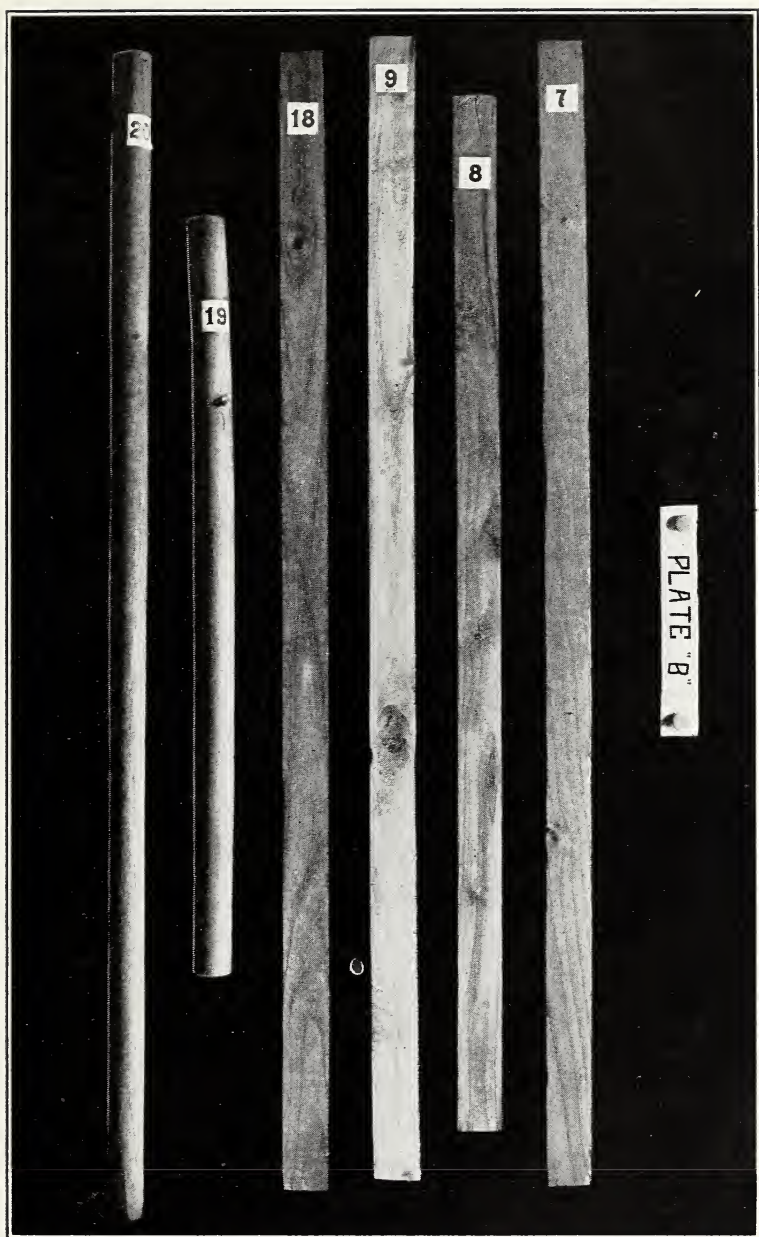
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6

PLATE A

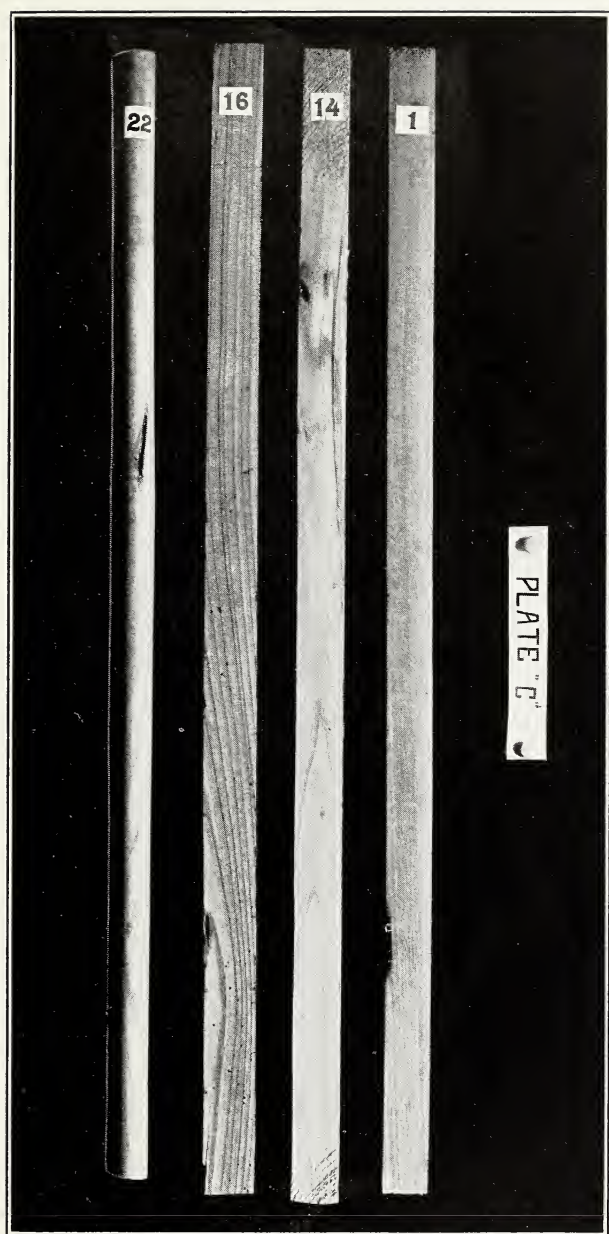
DESCRIPTION OF PLATE "B"

- No. 7. *Accepted treenail square.* Sound knots not exceeding $\frac{1}{4}$ " in diameter nor closer together than 4 inches.
(This is the flat grained face of the stick which makes it look cross grained at one end.)
- No. 8. *Accepted treenail square.* Sound knots no larger than $\frac{1}{4}$ " in diameter nor closer together than 2 inches.
- No. 9. *Rejected treenail square.* Knot in excess of $\frac{1}{4}$ " in average diameter.
- No. 18. *Accepted treenail square.* Sound knot with average diameter not in excess of $\frac{1}{4}$ ".
- No. 19. *Rejected turned treenail.* Knot no more than $\frac{1}{4}$ " in average diameter but unsound.
- No. 20. *Accepted turned treenail.* Sound knot no more than $\frac{1}{4}$ " in average diameter.



DESCRIPTION OF PLATE "C"

- No. 1. *Accepted treenail square.* Surface worm hole which will be removed in turning the treenail.
- No. 14. *Rejected treenail square.* Worm hole which penetrates the wood to a depth not permitting of its being removed in turning the treenail.
- No. 16. *Rejected treenail square.* Numerous small pin worm holes which penetrate to the interior of the square, the extent of the injury not being visible.
- No. 22. *Rejected turned treenail.* Worm hole.



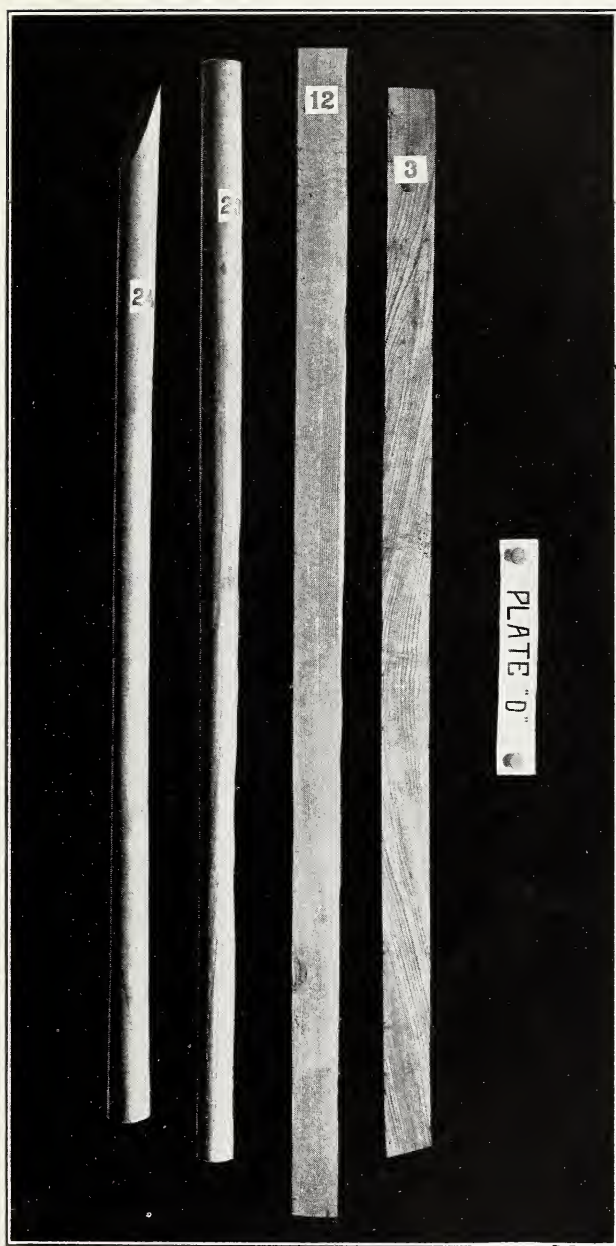
DESCRIPTION OF PLATE "D"

No. 3. *Rejected treenail square.* Cross grain with slope less than 1 inch in 20 inches.

No. 12. *Accepted treenail square.* Cross grain with a slope of more than 1 inch in 20 inches.

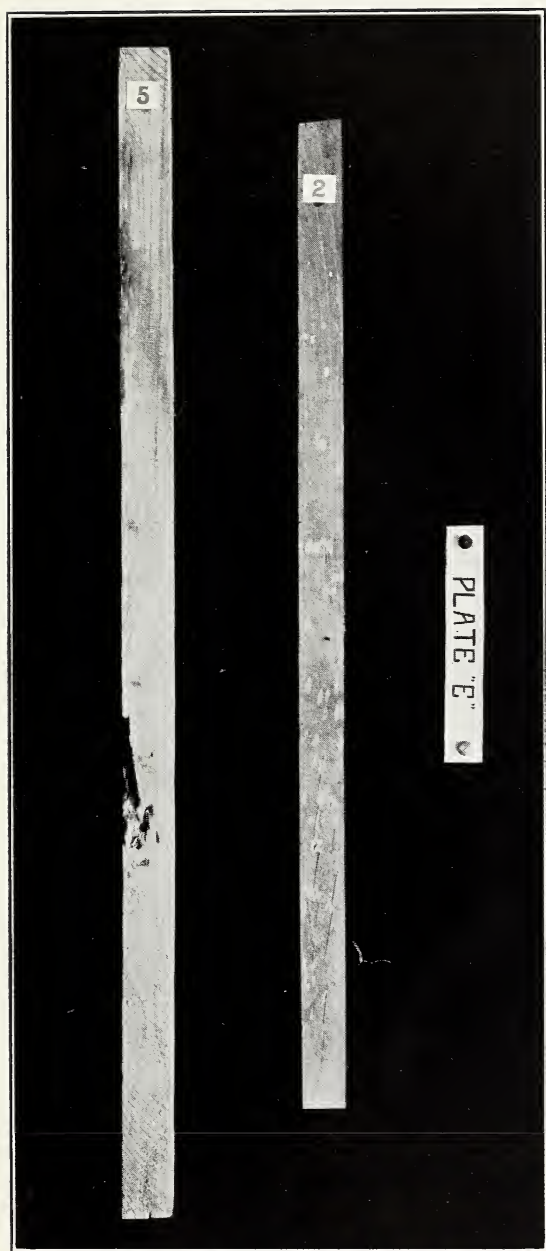
No. 23. *Accepted turned treenail.* Cross grain with a slope greater than 1 inch in 20 inches.

No. 24. *Rejected turned treenail.* Excessive cross grain.



DESCRIPTION OF PLATE "E"

- No. 5. *Rejected treenail square.* This piece is affected for three-fourths of its length with dry rot or "dote."
- No. 2. *Rejected treenail square.* Partial dry rot appearing in the form of spots throughout the square. Also numerous surface checks.



DESCRIPTION OF PLATE "F"

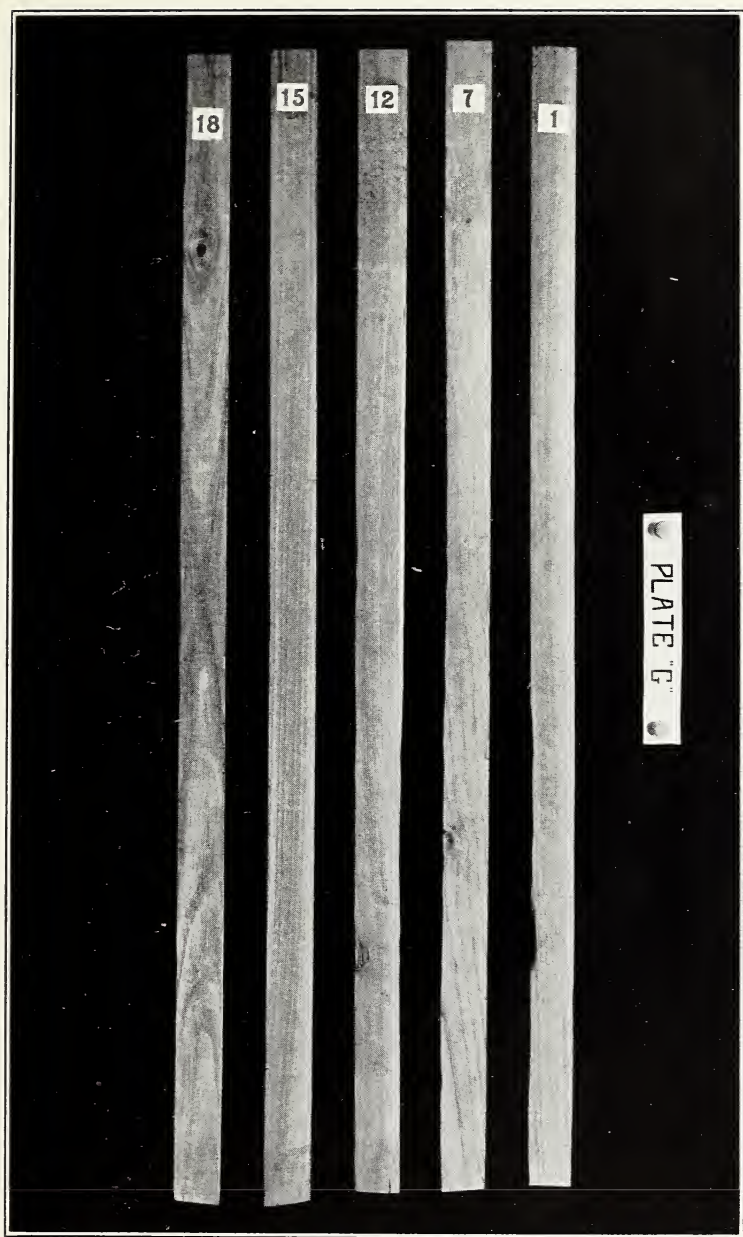
No. 11. *Rejected treenail square.* Wind shake.

● PLATE "F" ●

11

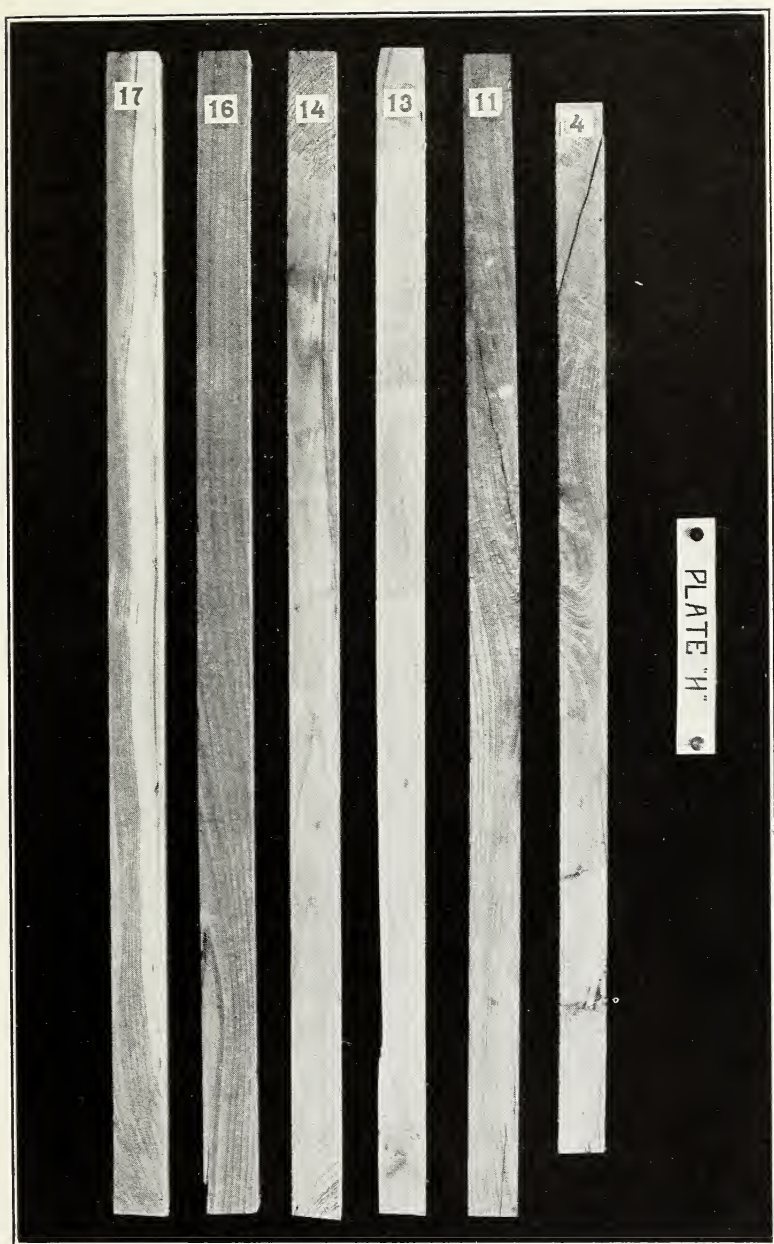
DESCRIPTION OF PLATE "G"

The samples shown in this photograph, Nos. 1, 7, 12, 15 and 18, are all acceptable squares under the specifications.



DESCRIPTION OF PLATE "H"

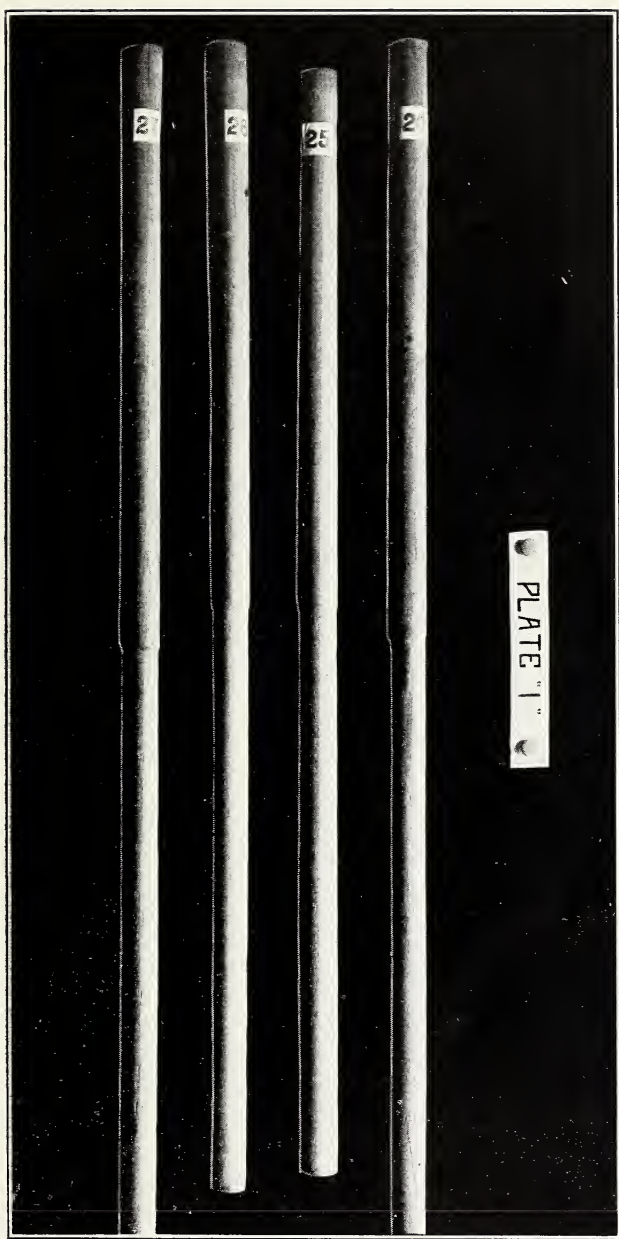
The samples shown in this photograph, Nos. 4, 11, 13, 14, 16 and 17, are all rejected squares under the specifications.



● PLATE "H" ●

DESCRIPTION OF PLATE "I"

The samples shown in this photograph, Nos. 20, 25, 26 and 27, are all acceptable turned treenails under the specifications.



DESCRIPTION OF PLATE "J"

The samples shown in this photograph, Nos. 21, 22, 28, 29 and 30, are all rejected turned treenails under the specifications.

